The Veterinary Record

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 46. NOVEMBER 15, 1941. VOL. 53.

"WAR GASES" AND FOODSTUFFS*

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These lectures attempt to give a short account of the dangers of "gas" contamination of foodstuffs and the simple protective measures which can be adopted to minimise the effects of this form of attack and the procedure which can be followed in order to free contaminated foodstuffs from the "gas" and thereby retain its food-value to the country.

Introduction

The maintenance of the full supplies and production of foodstuffs in this country during the present war is one of the vital problems before the Government, particularly as the war has developed in the main, into a large scale siege and counter-siege; ourselves attempting to blockade and thereby cut-off supplies from Germany, whilst the enemy has so far exploited every means in his power, except the use of "war gases," to interrupt our sources of supply. Ships, railways, docks, warehouses and other places of temporary or permanent food storage have been attacked by both H.E. and incendiary bombs, but up to the present, not by "gas." Nevertheless, this form of attack may be imminent and should it be used there is little doubt that foodstuffs will become contaminated. Hence a service must be organised to minimise this danger and neutralise its effects.

Recently the Ministry of Home Security and the Ministry of Food have appreciated this fact and local authorities have been requested to organise such a service, and active steps are now being taken in its development.

The ideal service organised to arrange for the protection of foodstuffs against the effect of "poison gases" and for the detection, seizure, decontamination and subsequent utilisation of gas-contaminated foodstuffs requires the co-operation of the A.R.P. services, medical officer, veterinary surgeon, chemical analyst and the food inspector, but in actual practice the municipal veterinary officer or food inspector is the individual charged with the development of the local service. The officer responsible, besides developing his own personnel and equipment, must secure the co-operation of the food storekeeper (*e.g.*, managers of food factories, of food stores, of markets, and of hotels, housewives, and even farmers). The service established to deal with poison gas and its effect upon foodstuffs must not be divorced from the other emergency services.

The menace of an aerial gas attack to the food supplies is probably less than is generally thought, owing to the fact that the exposure of foodstuffs to the concentrations of poison gas or vapour that are sufficient to incapacitate an unprotected human being would, in most cases, have comparatively little effect upon the foodstuff. Gas contamination of supplies can be achieved, however, by the high concentrations of gas liberated in the immediate vicinity of the exploded gas bomb, or those resulting from the successful spraying of gas by low flying aircraft. The concentration may also be increased to a dangerous level in a foodstuff by its continued action over a prolonged period in a confined space where it had accumulated owing to prevailing winds, structural conditions or other cause. Nevertheless, although the concentration of "gas" in a food may not be very high, it is clear that provisions which have become contaminated are unsuitable for immediate consumption either by man or animal.

The actual effects of gas-contaminated foodstuffs upon the consumer (man or animal) range from the production of nausea or repugnance to the onset of an acute or chronic alimentary disturbance sometimes resulting in death. Early symptoms of poisoning include loss of appetite, restlessness, grinding of teeth, vomiting, salivation, a craving for drink, signs of abdominal pain, and painful diarrhoea. But apart from the danger of poisoning, the repulsive effect upon the consumer of the somewhat peculiar or unpleasant smell or taste arising from gas contamination is a further factor demanding a decontamination service particularly where human foodstuffs are concerned.

Normally a foodstuff is seized by a food inspector either because it is likely to prove injurious to the consumer's health or because it is repugnant. The fate of a contaminated foodstuff will depend upon various factors; it may be seized because it is highly contaminated or because a change of taste or smell has been imparted to it although it will not actually be poisonous, or because its appearance or "bloom" has been materially altered by the effects of the gas. Its ultimate fate will depend upon the possibility of effecting its decontamination without destroying its food value and before it undergoes decomposition.

The basis of an understanding of the effects of war gases upon foodstuffs and the possibility of their successful decontamination depends upon a knowledge of the properties both of the gases themselves and of

* Based upon lectures given, with demonstrations, at the Smithfield Institute during the Autumn of 1941.

the foodstuffs. The nature of the foodstuff, particularly insofar as it contains a high concentration of water or a fat, will have some effect upon the extent of the contamination induced by a particular war gas and also upon the ease of its subsequent decontamination.

From this point of view foodstuffs may be divided into three groups :—

(1) Those which contain a high concentration of water, *e.g.*, green foodstuffs, turnips, potatoes, cabbages, lettuces, onions, lean meat, milk and water itself.

(2) Those which contain a low concentration of water or consist largely of fat, *e.g.*, dry provender, all kinds of flour, dry legumina, preserves, cheese, butter, lard, and other fats or oils.

(3) Those packed in sealed containers, such as wooden chests, barrels, tins, etc., which containers afford some degree of protection irrespective of the actual nature of the foodstuff itself.

Watery foodstuffs absorb more readily than those which contain little water such gases as phosgene and diphosgene. On the other hand gases of the type of mustard gas penetrate more deeply into fatty or dry provisions than into those with a high water content.

The water in a foodstuff may not only dissolve the "gas" but it may also decompose it and possibly remove its poisonous character. Thus phosgene and diphosgene are fairly rapidly decomposed by water, forming hydrochloric acid and carbon dioxide, two non-poisonous substances. Similarly mustard gas is slowly decomposed by water, giving hydrochloric acid and the non-toxic thioglycol. Lewisite, on the other hand, although rapidly decomposed by water, forms a toxic arsenic compound and hence the food still remains dangerous. The nose irritant "gases" are also converted into simpler arsenic compounds by water.

Some Properties of "War Gases"

The term "gas" as used in warfare refers to any chemical substance whether solid, liquid or vapour, which is used to induce poisonous or irritant effects on the human body. The term is thus a misnomer as the effects of these materials are not solely due to their being present in gaseous form, for substances in the liquid or solid state can also directly produce these effects.

War gases are usually classified according to their ability to persist in the locality into which they are introduced, or according to their physiological properties.

The non-persistent gases are substances which when liberated are rapidly converted into a true gas or smoke. The gas or cloud so produced continues to be effective only so long as it is not dissipated by dilution in the surrounding air. Included in this group are chlorine, phosgene and certain of the irritant arsenical smokes.

Persistent gases are generally liquids but sometimes particulate solids which vaporise comparatively slowly and, therefore, contaminate objects with which they come into contact for prolonged periods during which they continue to give off vapour. Included in the group are mustard gas, lewisite and certain tear gases.

Although war gases can be divided into persistent and non-persistent gases, their persistence in any particular locality will depend upon the properties of the gas itself, particularly its boiling point, and upon the climatic or atmospheric conditions prevailing at the time. Warmth, rain, wind or the circulation of

Gas.	Persistence c.f. Water = 1	Odour and/or Taste.	Penetrability into Water or Fat.	Stability towards Water.	Presence of Arsenic.
Lung irritants		All irritate throat.			
Chlorine ...	N.P.	Pungent	Readily soluble in water	Slowly decomposed	—
Phosgene ...	N.P.	Musty hay	Do. do.	Rapidly decomposed	—
Diphosgene ...	0·38	Musty hay, more so	Do. do.	Rapidly decomposed	—
Chloropicrin ...	0·23	Sweetish	Slowly soluble in water	Stable	—
Lachrymators					
K.S.K. ...	6·9	Pear drops	Slowly soluble in water	Stable	—
B.B.C. ...	325	Sour fruit, burning	Do. do.	Stable	—
C.A.P. ...	N.P. cloud	Aromatic, apple blossom	Do. do.	Stable	—
Nose irritants		All irritate throat			
D.A.	N.P. cloud	Aromatic, irritant	Insoluble in water	Slowly decomposed	+
D.C.	N.P. cloud	Bitter almonds	Almost insoluble in water ; dissolves readily in oils	Slowly decomposed	+
D.M.	N.P. cloud	Practically odourless	Insoluble in water	Stable	+
Vesicants					
Mustard gas ...	38	Garlic, horse-radish	Rapidly soluble in fat	Slowly decomposed	—
Lewisite ...	9·5	Geraniums, throat irritated	Do. do.	Rapidly decomposed	+
Dichloroarsines	ca. 1	Irritant to nose and throat	Do. do.	Rapidly decomposed	+

the surrounding air by other means accelerates the dispersal of gases. In the case of non-persistent gases, these are moved rapidly from one place to another by wind and diluted fairly quickly ; the danger is thereby diminished and its position varies. But with the persistent gases, although the vapour is moved by wind, the liquid or solid contaminating the ground or other object remains, so that the area of danger also remains until all the " gas " has actually vaporised. The length of time it persists will, however, be shortened by wind. Conversely, gases will persist longer if the air is still, or the temperature is low, as in a refrigeration store. Occasionally, however, a breeze by driving gas into a confined space or through into the interior of a building may actually increase the danger in that particular spot.

It is not the purpose of these lectures to detail the physical, chemical and physiological properties of war gases, but some are of particular importance in considering the contamination of foodstuffs. These are the persistence of the gas, its taste or smell, its power of penetration into different materials such as water or fat, its stability towards water and its content of arsenic.

The table summarises this information.

The Protection of Foodstuffs from War Gases

The adoption of any measures of protection to safeguard against a particular danger must depend upon careful assessment of the factors involved. These include an appreciation of the severity and extent of the potential danger, the gravity of the ill effects likely to arise from it, the ease with which these ill effects can be satisfactorily removed, the efficiency of the protection available and the comparative costs of the steps necessary to secure protection and of those necessary to ensure the removal of the danger once it has occurred and the minimum of any ill effects produced by it.

The consideration of costs is of less importance during war, partly because of the necessity to beat the enemy irrespective of the cost and partly because it is not possible to estimate in monetary terms the value at such a time of avoiding anything which will lower the morale or directly affect adversely the health of the community. No one outside those circles which possess reliable information upon matters of defence against hostile attack can adequately appraise the severity and extent of the potential danger arising from " gas " warfare, but theoretically, provided the attacker has mastery of the air, and decides to employ " war gases " the danger becomes a very real one scarcely limited either in severity or extent. When " gas " warfare is prevalent the danger of contaminating foodstuffs is real, for the " gases " used are highly penetrative substances which will often gain access to the interior of buildings and food containers not only through large or minute openings but also through the texture of many of the materials of the buildings and containers themselves. Furthermore most food materials will absorb these gases readily.

Although the decontamination of foodstuffs affected by " war gases " is not usually a very difficult process it is nevertheless easier to prevent such contamination than to remove it while at the same time maintaining fully the attractiveness and nutritive value of the foodstuff. Hence protective measures should be adopted at all food and fodder depots, including large food stores, warehouses, distributing markets, food factories, hotels and other institutions, retail shops, the homes of the people, farms, cattle yards, large cattle sheds and other central establishments for fattening cattle and other beasts, and abattoirs.

The main aim of a food protection service for this purpose will be to stop any " war gas " in either the liquid or truly gaseous form from reaching foodstuffs. The danger of this contamination can be reduced by insisting upon the greatest practicable dispersal of buildings housing food animals or foodstuffs and where feasible the buildings should be made as gas-proof as possible. Materials for this purpose should be made readily available to those in charge of such buildings.

The best method of stopping direct liquid contamination is to prevent the " gas " from falling on to the foodstuff itself. The housing of the food materials in buildings, particularly if doors, windows and other obvious openings are kept closed or protected by suitable curtaining, obviates this danger to a very great extent. Actually some protection from droplet contamination is afforded to objects in the streets of built-up areas by the adjacent buildings. Foodstuffs in the open, and to some extent even those within buildings, should be protected still further by screening. This can be achieved either by placing them, when possible, in cupboards, refrigerators, etc., or by arranging suitable materials, preferably tent-wise, over the collection of food material, making sure that the screen is separated from it by a reasonable air space. This protective effect can be improved still further by using a double screen, the two " layers " being separated from each other by another air space. The best screening materials to use are metal sheetings, oilskins and oil-dressed tarpaulins, but if these are not available or are impracticable because of expense, canvas or almost any material which will absorb drops of liquid falling upon it will give useful protection, provided every care is taken to ensure that the screening is complete and that at no place does it actually touch the foodstuff.

Wrapping materials afford foodstuffs a degree of protection from liquid contamination varying from momentary to complete protection. Those materials, such as open-work crates, baskets and sacks, which allow some of the falling " gas " droplets to pass straight through on to the foodstuff and those such as close sacking which absorb the liquid so readily that it almost immediately soaks through to the inner surface, afford only momentary protection, but those, such as glass or polished metal, which do not absorb the " gas " at all, afford complete protection.

In order to safeguard foodstuffs in buildings against contamination by " poison gas " in the gaseous form they should be sealed so that it is made extremely difficult for air to enter. Windows, doors, ventilation openings, holes in the wall, cracks, etc., should be closed with suitable materials. Similarly containers should be sealed, using non-porous and non-absorbent substances as far as possible both for the containers themselves and for the sealing of them. Loose foods and individual parcels of foodstuff should be stacked as closely as possible and in as large a heap as convenient so that some protection is afforded to the main bulk of the supply by the surface layers. Materials should also be ready for the rapid decontamination of surrounding areas affected by persistent gases.

The Protective Value of Materials used for Packing Foods

Materials used for wrapping foods are usually chosen mainly to withstand the amount of handling they are likely to receive before reaching the consumer, and accordingly they vary from flimsy paper to metal. These materials (see "Food and Its Protection Against Poison Gas" issued by the Ministry of Food and published by H.M. Stationery Office, price 3d.) offer a variable resistance to the passage of "gas," that offered to vapour generally being better than that offered to liquid. Complete protection against both vapour and liquid is given by sealed metal drums, sealed metal-lined cases or casks, sealed tins, glass bottles and glazed earthenware vessels with well-fitting lids or stoppers of metal, glass, bakelite or other impervious materials and sealed wooden barrels used for the transport of liquid. Prolonged liquid contamination of the barrels may give rise to some absorption of the "gas." Bottles and glazed jars sealed with ordinary cork stoppers give a good and those covered by grease-proof paper a fairly good protection, although the protection against liquid in the latter case is less good. Metal foil wrappings give good protection if they have no pinholes. Wooden boxes afford good protection against vapour if all joints are tight but the protection against liquid is poor, particularly if the wood is soft. Oilskins and tarpaulins protect well against liquid but less well against vapour. Well-jointed thick cardboard boxes are a good protection against vapour but are too absorbent to be of much service against liquid. Waxed and papier maché cartons, if well sealed, usefully protect against the vapour, but to be equally effective against the liquid they must be covered by a layer of a transparent cellulose wrapping or have their joints sealed with wax. The protective qualities of paper vary very considerably. Ordinary paper containers offer no resistance to the passage of liquid "gas" and only little resistance to vapour. Dry moisture-proof cellulose film, particularly that made from cellulose, nitrocellulose or cellulose acetate, paper bags lined with moisture-proof cellulose film, grease-proof paper and two or three-ply bitumen or tar-lined paper afford good protection against vapour or light contamination with liquid. The protection offered by moisture-proof cellulose film is not so good when it is wet and that given by grease-proof paper is materially reduced if the paper is creased. Sacks, canvas, hessian and other textiles give no protection whatever against vapour and none, unless used as screens, against liquid.

The wrappings or containers to be recommended in any particular case would depend upon the extent of the handling expected before consumption, the availability of the particular wrapping materials and the keeping qualities of the foodstuff under consideration.

Local Protective Measures

Protection on the Farms.—The best protection for farm stock against enemy action is dispersal but when "poison gas" is used, it is advisable to have some cow-shed or other building made relatively gas proof. This can be done with inexpensive materials. Cracks and holes should be filled in with putty or, if large, they should be covered with wood. Doors can be covered with strong glue and strong paper and they should be made to fit well with strips of felt, etc. Windows and doors should be shrouded with heavy blankets; pipes, air shafts, etc., must be carefully stopped up and ventilators should be closed and made comparatively gas-proof with damp hay, etc. The air content of a cow shed so "sealed" will cause no harm to the normal number of animals for at least three hours, a time generally in excess of the period of danger. "Gas" penetrates good walls only after several hours, during which time the gas cloud is almost certain to have been dissipated and to have reached a concentration well below that necessary to bring about its passage through the walls. In closed stables and cowsheds the ammonia produced from the urine will partially inactivate chlorine, phosgene, etc., but it will not affect mustard gas.

Protection in Markets.—In the case of open-air markets little can be done save to have the materials and service ready to deal immediately with any gas attack and to arrange for foodstuffs to be, so far as possible, in gas-proof containers. The authorities, in the event of the frequent use of "gas," may have to close all open-air markets.

The buildings of indoor markets should be rendered gas-proof by paying attention to all openings, intentional or otherwise, windows, ventilation arrangements, etc., in the way described in the special instructions issued by the Government to guide the public in the matter of making rooms, etc., safe against "gas" attack. Indoor markets must be closed immediately upon receipt of a warning.

Protection of Bulk Stores in Warehouses, Docks, etc.—Where possible the following principles should be adopted.

(*a*) Place as much food as possible in chambers, refrigerators, cold rooms, etc., when, if the doors are gas-tight and ventilation is stopped, no further protection is needed.

(*b*) Vulnerable foods, such as those that are unwrapped, or those stored in hessian wrappings, open crates, sacks, etc., should be kept away from top floors or basements.

(*c*) Arrange crates, boxes, etc., of foodstuffs in stacks and screen these by covering with tarpaulins or oilskins or by using canvas or sacking as described earlier. Make certain that the ends are down, etc. Where adequate ventilation is necessary, as with fresh fruit, suitable screens or curtains should be ready to pull into position.

Protection in Retail Shops, Hotels, Institutions, etc.—(*a*) Non-perishable food (unwrapped or with permanent wrappings) should be placed as far as possible in gas-proofed rooms.

(*b*) Other foods should be placed in refrigerators, cupboards, etc., with well-fitting locks or else placed as far from windows and other openings as possible, so as to reduce their exposure to "gas" to the minimum.

(*c*) Further protection should be afforded by the use of screens or covers of tarpaulins, oilskins, canvas or coconut sacking.

(*d*) Packed foods should be left as long as possible in their packings.

(*e*) Preparations should be made for the immediate closure of all windows and doors, and the turning off of extractor fans, etc., as soon as warning of a raid is given.

Protection in the Home.—(*a*) So far as possible place all foodstuffs, whether protected by wrappings or not, in cupboards, bins, well-fitting boxes and tins, etc.,

to protect them from splashes. Small containers for foodstuffs can be sealed with paraffin wax. If desirable, a small room may be prepared as a gas-proof store.

(*b*) Wrap containers that are not gas-tight in transparent cellulose, etc.

(*c*) Place all perishable food so far as practicable in the refrigerator. Keep clean the necks of opened bottles still containing food and place them in tins, if possible, as such exposed food will readily absorb the gas.

The Protection of Food in Transit.—Whenever possible foodstuffs in transit should be carried during a period of gas warfare in sealed vans, preferably refrigerator vans, but if these are not available open carts or trucks should always be covered, preferably with tarpaulins of the oil-dressed or cuprammonium-bitumen type ; any cover, however, is better than none providing it is not actually in direct contact with the foodstuff. Unloading and breaking of bulk should be carried out under cover and heaps of foodstuffs exposed in the open should be protected by screens of tarpaulins, etc., arranged over them tent-wise, *i.e.*, with an air space between the screen and the foodstuff. Similar precautions should be taken at ports when ships are being unloaded. Should a raid occur during unloading then the hatches should be closed immediately and they should be covered with tarpaulins.

With regard to the sending forward and issue of provisions to armies or crowds of refugees, etc., the issuing points must be carefully selected. They should be places which by reason of their position are not likely to be exposed to " gas " attack. Thus the danger may be reduced by issuing at night directly from railway trucks outside stations, the point of distribution frequently being changed. Large supplies of stores should be put in inconspicuous places. Animals belonging to the provisioning depot should be kept close to the slaughterhouse ; where possible they should be on wooded high ground. It is scarcely feasible to do without tarpaulins and other coverings for the protection of army provisions, even when only a small supply is carried. At home preparatory arrangements should be made for the prompt despatch of supplies and for storing them in relatively safe and properly distributed districts so that provisions will be available locally in case of need for any section of the country.

Protection in Factories.—Adjustment should be made to the machinery of food factories so that the food material will be protected as completely as possible from contact with the outer air. When the foodstuff is exposed to the air during its course through the machinery to the final container, these points of exposure should be protected by screens or suitable additions to the machinery.

Protection of Certain Food-stuffs and Fodder

Meat and meat products should be protected against " war gases " by covering them carefully with tarpaulins or, in smaller amounts, wrapping them firmly in grease-proof paper or transparent cellulose sheeting, *e.g.*, weather-proof cellophane. The latter should be shielded from moisture as much as possible. Cellophane skins are advisable for smoked sausages instead of the usual skins, but even so it is advisable to wrap the sausages in bundles with uncreased cellophane. Meat can be satisfactorily stored in well-sealed refrigerators and cold rooms.

When " gas " attacks are frequent fresh meat may most conveniently be transported in sealed refrigerator vans or if these are not available it may be divided into pieces of 11-22 lb. in weight, wrapped in parchment paper and packed in tightly-fitting boxes lined with parchment paper.

Fodder.—Naturally, war chemicals penetrate foodstuffs more deeply when lightly heaped than when they are tightly packed, therefore fodder of the type of hay and straw should be pressed, heaped and covered with a tarpaulin. Hay is very much more susceptible to mustard gas than is straw. In an emergency haystacks, etc., can be protected on all sides with a 6 in. layer of straw—preferably long stalked—which should be removed after " gas " attacks. This prevents the greatest danger. Similar remarks apply to all heaps of animal foods, etc., but care must be taken that the edges of asphalt sheeting or tarpaulins are held down and well covered with earth. For smaller quantities of materials such as meal, dog biscuits and similar foods, greaseproof paper and more especially transparent cellulose sheeting, such as waterproof cellophane, afford useful protection. In the case of " hard " vegetables, legumina and sugar which are packed at the factory, a special wrapping such as weather-proof cellophane, greaseproof paper, etc., should be specified.

For the transport and preservation of corn, one of the best methods is to store it in double, finely meshed sacks lined with strong paper (parchment paper). It is even safer to line the sacks inside with fabrics which resist the passage of mustard gas. Yet it must be borne in mind that such measures are out of the question for a long period of storage because corn, especially in the form of flour, becomes in time fusty and mouldy.

Water.—It is not necessary to attempt to protect large reservoirs from contamination with " war gases " for the two practical reasons that firstly, the water in such reservoirs usually undergoes sufficient treatment before it reaches the consumer to cause it to lose any danger which may have been imparted to it and, secondly, it is not possible for an enemy to contaminate to a dangerous degree such large quantities of water as are present in reservoirs. Similarly it is practically impossible to render the flowing water of rivers, streams, etc., dangerous by " poison gas " attack. Real danger from the use of water contaminated with " war gases " will only arise when the main supply has been interfered with and the population has to fall back upon small reservoirs, ponds and other unusual supplies.

Measures should be taken to protect small supplies of water from liquid contamination wherever this is practicable, by covering them with shields of wood, metal, tarpaulin or other material. All small tanks and similar storage vessels should be covered.

Factors Affecting Degree of Contamination

The extent to which a particular foodstuff becomes contaminated as a result of a " gas " attack will depend upon :—

1. The active concentration of the gas present.
2. The period of time during which it can act upon the foodstuff.
3. The character of any surfaces in the immediate vicinity of the food store and upon which the gas falls.

4. The nature of the foodstuff and the nature of the "gas."
5. The thoroughness with which protective measures have been adopted.

1. The concentration of "war gas" in any particular place will depend firstly upon the method of attack used, and secondly upon whether the particular "gas" is delivered as a particulate solid, liquid or vapour. The gas may be delivered as a fine spray from high-flying aircraft, as a close spray from low-flying aircraft, or as a heavy local concentration arising from gas bombs. The fine spray is only likely to give rise to slight contamination, but heavy contamination of foodstuffs may ensue when gas spraying or bursting gas bombs have been used.

2. The period of time during which gas may be a danger at any particular spot will depend upon its initial concentration, its persistence, upon environmental conditions such as weather, upon the extent of the protection afforded the foodstuff (*e.g.*, wrappings, containers, anti-gas precautions), and upon the rapidity with which the decontamination service is brought into action. A high wind will rapidly disperse a non-persistent gas and cause a persistent gas to disappear sooner than if the atmosphere was calm. Similarly a high temperature will encourage the vaporisation of droplets of gas while very cold weather will diminish the rate of vaporisation but may maintain the "gas" in a concentrated form in the frozen condition. For example, mustard gas will be frozen if present in cold stores, but it retains the power to cause burns if it touches human skin and is still able to vaporise and cause danger when removed to normal temperature. Heavy rain materially reduces the concentration of "gas" and considerable amounts will be washed off the surface of exposed contaminated objects. As "war gases" are heavier than air, they will tend to sink into hollows, depressions, basements, etc., and hence such places may remain dangerous long after the gas has been dispersed from adjoining affected areas. The presence of "gases" causes belts of trees to remain dangerous for a much longer time than open ground. In built-up areas persisting pockets of gas may arise almost anywhere as the result of peculiar air currents.

The nature of the containers or wrappings will affect the length of time a foodstuff is exposed to danger; thus those that are impermeable limit the danger to the period of opening the container whilst it is still contaminated. Wrappings made of absorbent materials such as soft wood, cardboard, paper, etc., may, however, increase the period of time during which the gas can act, as they hold the gas in close proximity to the underlying foodstuff for a prolonged period.

3. The character of the surfaces in the immediate neighbourhood of the foodstuff may affect the extent of contamination of the food. If these surfaces are impervious the "gas" will vaporise comparatively rapidly and a dangerously high concentration of vapour may arise for a short time. A material such as brick will absorb a considerable proportion of the "gas" and will prolong the period of vaporisation, although the degree of danger may be less as the concentration of vapour will be lower. Earth, soft wood and textiles may be classified along with brick as absorbent or permeable; concrete, stone, paintwork, rubber and hard wood are slowly permeable, while glass and polished metal are completely impermeable.

4. The nature of the foodstuff itself will affect the activity of the "gas" for, as has been previously explained, fatty or dry foods will be more readily affected than watery foods by some "gases," *e.g.*, mustard gas, whereas the reverse is true with other "gases" such as phosgene. If the foodstuff is a liquid, its contamination will depend to some extent upon whether its main base is water or oil. Furthermore, the natural covering of the foodstuff may materially affect the extent of contamination. Thus cereals such as bearded barley and maize, or legumina such as beans and peas, are naturally much better protected from "war gases" by their firm, tough husks than are, say, unbearded barley, and oats. In the case of oats, liquid war gases of the mustard gas type, quickly penetrate the grain in spite of the husk as this is only partially joined to the seed at its base. Various fruits and vegetables are naturally protected by their outer skins for a limited time from the effects of "war gases." The skin of the orange is very resistant and that of the apple offers some resistance to the passage of "gas." The outer layer of the onion is not permeated for a long time by mustard gas, but it gradually penetrates the skin of cucumbers and carrots, forming characteristic depressions where the drops fall; in the case of the potato "gas" droplets quickly spread on the surface and soon penetrate the tuber, leaving brown, sharply defined stains. The physical nature of the food, particularly as it affects the closeness of the packing, also has some effect upon the extent of the contamination. Heaps of finely powdered foodstuff such as flour will not be contaminated in the interior, but the penetration of the "gas" will be greater into similar heaps of a coarsely granular foodstuff such as unground cereals.

The effect of a "war gas" upon a foodstuff will naturally depend upon the "gas" used. The lung-irritant and non-persistent tear gases have very little effect upon foodstuffs and do not render them dangerous to eat. They may, however, affect the appearance, odour or taste, and therefore foodstuffs so affected may have to be rejected for human consumption on that account, or treated to remove the contamination.

The persistent tear gases, *e.g.*, KSK and BBC, have unpleasant smells which generally make affected foodstuffs unpalatable.

The nose-irritant gases and other arsenicals (lewisite, arsine) must always be considered a source of danger and foodstuffs affected by them must be held back for closer examination so that the risk of arsenical poisoning of the consumer can be obviated.

The blister gases, *e.g.*, mustard gas and lewisite, are likely to contaminate all foodstuffs with which they come into contact and render them a potential danger to the consumer. Mustard vapour does not affect very seriously non-fatty foodstuffs, but it is more readily absorbed by those containing a high proportion of fat, and these may become dangerous.

Food contaminated by liquid mustard gas must always be considered to be a source of danger. Usually the gas penetrates fairly rapidly, yet under practical conditions even with consolidated fats such as butter, it rarely penetrates within 24 hours to a depth of an inch. Contamination by liquid mustard gas can often be detected by the presence of dark spots or stains upon the surface, unless the foodstuff is dark in colour.

The effects of contamination with lewisite and the other arsenical blister gases are similar to those produced by mustard gas but the affected foodstuff carries the further danger of arsenical poisoning.

5. The fact that the extent to which foodstuffs may become contaminated with " war gases " liberated in their proximity will depend to a considerable degree upon the thoroughness with which protective measures have been previously adopted needs no further elaboration. It should be pointed out that protective measures include the methods adopted for stacking, covering and screening foodstuffs and their storage in gas-proofed buildings.

Decontamination

Before undertaking decontamination of foodstuffs affected with " war gases," it is advisable to be sure that the general food position in the country, the cost of the decontamination, and the probable reduced economic and nutritional value of the salvaged food, justify undertaking the task. If decontamination is not advisable, as when food is plentiful, the contaminated foodstuffs should be immediately destroyed. When the preservation of every scrap of food becomes important, as in the later stages of modern large-scale siege warfare, the decontamination of gas-contaminated foodstuffs must be undertaken whenever possible.

General Principles of Decontamination

Decontamination is a process by which a contaminated object is rendered harmless to living beings. It may be achieved by :—

1. The chemical destruction of the gas, *e.g.*, using bleach cream, potassium permanganate, alkali, boiling water, etc.

2. The physical removal of the gas, *e.g.*, by washing, by solvent action, by evaporation, by weathering, or by covering the contaminated object with a seal through which the vapour cannot emerge. This latter method is obviously of little or no application where the salvage of contaminated foodstuffs is concerned, but it may be of service to remove the danger arising from contaminated foodstuff which is not fit for salvage.

The practical application of these methods of decontamination will depend in very great measure upon the following factors :—

(*a*) The identity of the gas.
(*b*) The nature of the foodstuff.
(*c*) The protection afforded to the foodstuff by packings, method of stacking, protective measures, etc.
(*d*) The severity of the contamination.
(*e*) The time available in which a particular object may be satisfactorily decontaminated.

Thus human beings or animals must be treated within a period of 10 minutes after contamination with mustard gas if treatment is to be effective. Similarly, exposed fresh foodstuffs must usually be treated fairly rapidly if salvage is to be effected, but food in impervious tins can be treated more or less at leisure.

Methods of Service in Securing the Salvage of Contaminated Foodstuffs

Although each of the following methods can be grouped under one of the three main methods of decontamination already described, it will be more helpful to describe them individually as follows, when considering their application to foodstuffs.

1. Aeration.
2. Washing.
3. Removal of contaminated surface layer.
4. Suitable cooking.
5. Dilution by admixture with similar but unaffected foodstuff.
6. Appropriate chemical treatment.
7. Weathering.
8. The application of two or more of the above methods serially.

1. *Aeration.*—This is probably the most effective method of decontamination of foodstuffs as it effects the removal of the gas without using any procedure or agent likely to diminish markedly the value of the foodstuff. As a rule contamination causes no chemical change in the foodstuff, and hence if evaporation of the gas can be encouraged by the adoption of suitable measures, the gas can generally be removed sufficiently rapidly to leave the foodstuff in a perfectly edible condition and with the minimum of change. Under reasonable conditions, an aeration period of 48 hours is adequate, but this may be shortened or prolonged depending upon the volatility of the gas and the environmental conditions. The method can usually be applied with success to foodstuffs when the contamination is " slight," that is to say when the contamination arises from ordinary gas clouds or from spray from high-flying aircraft.

Decontamination by aeration can be allowed to proceed unassisted but the time required for the completion of the process is materially shortened by the adoption of certain simple procedures which hasten the evaporation of the " gas." The contaminated foodstuff should be apread out as far as practicable so that the maximum surface is exposed to the air ; when possible the material can be repeatedly turned or shaken. Foods stored in sacks or in permeable containers should be arranged so that the individual sacks are surrounded by air. An increase in the rate of evaporation can be achieved by ensuring rapid movement of the air over the contaminated surface. This can be secured by the construction of the decontamination building, or by the use of fans or other mechanical devices. The rate of evaporation may also be increased by raising the temperature of the foodstuff and its environment. One of the best methods for the removal of gas rapidly from affected foodstuff is to submit the latter to suction, the pressure of the overlaying air thereby being reduced, and the gas vapour continuously removed. This last method is more costly and less practicable, however. Usually two or more of these aids to efficient aeration are employed simultaneously.

The advantages of aeration for the decontamination of foodstuffs are its relative ease of application, its negligible effect upon the foodstuff, and its comparatively low cost.

2. *Washing.* — Considerable decontamination of foodstuff affected with liquid " gas " can be achieved by careful washing with water, when the affected foodstuff can withstand this process. This method is useful particularly with those foodstuffs which have fairly hard and comparatively impervious surfaces and where washing can take place soon after contamination. It is also useful for washing down contaminated containers made of non-absorbent material such as bottles, tins, casks, etc. If a hose is used to assist with the washing, the force of the water

must not be such that it damages the foodstuff, and care must be exercised to see that the washing water is conducted safely away.

Liquids other than water, *e.g.*, petrol, alcohol, etc., may be used for the removal of liquid "gas," but they exert their action more as solvents of the gas, whereas the main action of water is its mechanical removal. Other washing liquids cannot be used in bulk, and usually they are applied with a rag or other swab. Care must be taken to change the rag repeatedly and to avoid the spread of the contamination. All used swabs must be destroyed, preferably by burning. Sometimes much of the liquid gas may be removed from a surface by the simple process of mopping up with dry rags, sawdust, earth, etc.

These methods of removing liquid "gas" from affected surfaces are not methods of complete decontamination, but are useful methods to reduce materially a gross contamination.

3. *Removal of Surface Layer.*—Reasonable decontamination may frequently be achieved by removing the surface layer where liquid gas has affected foodstuffs of relatively firm consistence. This method is useful where the adhering liquid "gas" cannot be removed by washing as the "gas" has actually penetrated into the body of the foodstuff. The penetration, however, is not as deep as is generally believed, the food material is not porous, and hence although the depth of the layer to be removed will vary to some extent with the nature of the foodstuff and that of the "gas," it is rarely necessary to remove a layer of more than ½ inch in thickness. The contaminated removed layer must either be destroyed or, if its food value is to be retained, submitted to some further process of decontamination. Usually it is destroyed or passed on for manufacturing purposes. This small loss is justified as the greater proportion of the foodstuff is salvaged.

4. *Suitable Cooking.*—Cooking or heating of contaminated foodstuff, provided this is not carried out in a small sealed container, will generally result in the evaporation of the bulk of the gas: it must be remembered that the escaping fumes may be dangerous. Foodstuffs contaminated with mustard gas, however, must be decontaminated by boiling with water as dry cooking, such as roasting, grilling, or frying does not destroy the gas or drive it off, possibly because of its retention in the cooking fat. Half an hour's boiling is usually sufficient, and one hour's boiling is adequate even for the heaviest contamination, unless the foodstuff is very fatty. The boiling water must be discarded despite the fact that it decomposes the "gas." If an alkali such as soda is added to the boiling water the rate of decomposition of the mustard gas is increased. No cooking process removes the danger from a foodstuff contaminated with an arsenical.

5. *Dilution with Uncontaminated Foodstuff.*—If a foodstuff is only slightly contaminated with a poisonous "gas," particularly if the gas concerned is not highly dangerous, *e.g.*, one of the lung irritants, its effect on the consumer can be minimised by mixing the affected foodstuff with several times (five or ten times) its bulk of similar but uncontaminated material. This will not only diminish the toxicity of the foodstuff below the harmful level, but it may also dilute any taint affecting the sense of taste and smell or overcome any diminution in the cooking quality of the affected foodstuff. This method is only suitable when dealing with powdered foodstuffs or those which can be mixed intimately with the wholesome material.

6. *Chemical Treatment.*—One of the most satisfactory methods of decontamination depends upon the destruction of the toxic substance by chemical means. This process is not so useful with foodstuffs as the chemical agents used are likely to affect adversely the appearance and quality of the foodstuff itself. For example, tear gases can be destroyed by a mixture of equal parts of glycerine and 50 per cent. caustic soda, but this treatment is obviously unsuitable in general for the salvage of foodstuff. Mustard gas can be destroyed by chlorination, using a bleach cream or paste and removing excess of the agent with water, again a method unsuitable for the direct treatment of contaminated food material. Chemical methods are, nevertheless, of service when dealing with certain contaminated food containers, and in the treatment of "meat on the hoof" and unskinned carcases.

7. *Weathering.*—Most contaminated foodstuffs will ultimately become free from "gas" if allowed to "weather" sufficiently long. The time necessary is generally too long, for the foodstuff would often go bad before it had been freed from the gas, and hence this method is of limited application where foodstuffs are concerned. Weathering is a complex process involving aeration, washing (rain) and heat treatment (sun) but without artificial aids to these operations. It is serviceable when dealing with certain contaminated growing crops or with various fodder materials. In the latter instance, the process may be assisted by spreading and shaking the affected material.

8. *Combined Methods.*—To ensure the most complete decontamination and the maximum of safety to the consumer, it is advisable to treat most contaminated foodstuffs by more than one of the above methods. A foodstuff grossly contaminated should generally receive a preliminary treatment by washing, removal of surface layer or with chemicals before it is submitted to aeration. The latter will reduce the contamination to negligible proportions, but considerations of complete safety, taint or impaired cooking qualities make it advisable to mix the treated material with wholesome foodstuff or to subject it to a suitable cooking process. Thus the decontamination of foodstuffs contaminated with "war gases" can be looked upon as a process taking place in three stages:—

(*a*) The removal of "gross" contamination by washing (mopping, swabbing), by removal of contaminated surface layer, or by chemical treatment.

(*b*) The reduction of "slight" contamination to traces by aeration.

(*c*) Ensuring that trace contamination does not impair the quality or safety of the foodstuff to the consumer by carrying out suitable cooking or by admixture with similar but wholesome material.

(*To be concluded.*)

Weekly Wisdom

"*. . . It is always a good thing not to create anything new if there exists something good to answer the purpose. . . . We do not* teach *service in the public schools, or leadership, or the Christian spirit. We impart them by life and example, which is the only way in which it can be done.*"—Sir Annesley Somerville, K.B.E., M.P., in Discussion on "The English Public Schools," *J. Roy. Soc. Arts*, 1941, September 5th, p. 649.

CLINICAL COMMUNICATION

Breech Presentation in the Mare

J. McILWAINE, M.R.C.V.S.,
LLANDYSSUL, CARDS.

The following description of the application to the mare of a method of delivery which is largely practised in this district in selected cases in cattle may be of interest to practitioners, especially those engaged in country practice.

My efforts resulted in one (hind) leg of the foetus being roped, but the other limb could not be reached.

Accordingly, stout ropes were tied over the proximal sides of the hocks of the mare and by means of pulleys attached to a strong branch of a tree the hindquarters of the mare were lifted about 3 feet from the ground. It was comparatively easy to extend the roped leg of the foetus, by passing the cord on to the coronet and correcting in the usual manner, remembering of course that the foetus was now lying on its back.

No difficulty was experienced with the other leg and delivery was effected in a short time.

In the writer's opinion, this method is invaluable in cases of eversion of the uterus in the cow, difficult parturition cases of all kinds, wounds on the mammary gland, teats, etc. Sacks of hay or straw should be placed under the patient to ensure comfort and prevent a swaying action.

THE GENERAL TUBERCULOSIS SITUATION IN THE U.S.A.

In a paper to the 1939 annual meeting of the United States Livestock Sanitary Association (Abst. *Vet. Bull.* **11**. 580) A. E. Wight records that in the modified accredited areas during the year ended June 30th, 1939, 10,000,000 tuberculin tests revealed about 33,000 reactors. In California, the only state not wholly accredited, initial testing of all animals was completed. The Virgin Islands attained accredited status in December, 1938, and all municipalities of Puerto Rico in January, 1939. During the year 195,000 cattle were tested prior to inter-state shipment. Only 22 reactors were disclosed.

Avian tuberculosis continued to be prevalent specially in Central and North Central States. Of 98,000 flocks examined, 3,300 were infected. Tuberculin tests of swine revealed a higher percentage of reactors to avian tuberculin than to mammalian.

During the year 9,500,000 cattle were slaughtered under Federal supervision. Apart from known reactors to the tuberculin test, about 10,000 showed signs of tuberculosis. Of these only 2,400 were condemned as unfit for food. Of 38,600,000 swine slaughtered during the same period 3,400,000 showed evidence of the disease. Only 28,000 of these were condemned.

Johne's disease was reported from 16 different states and 3,560 cattle were tested during the year. Of these 321 were classified as reactors.

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The Council of the Clydesdale Horse Society, meeting in Glasgow, decided to ask the Department of Agriculture for Scotland to institute a scheme of assistance for heavy horse breeding, similar to that about to be revived in England.

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Some 30,000 pit ponies in Britain's coal mines have been fed entirely on hay and oats. In future, straw pulp at a maximum rate of 20 lb. per pony per day may replace 3 lb. of oats and 6 lb. of hay.

ABSTRACTS

[**DIABETES INSIPIDUS IN A HORSE.** KRUPSKI, TOBLER and KUNZ. (1940.) *Schweiz. Arch. Tierheilk.* **82**. 445-454.]

The authors describe a typical case of diabetes insipidus in a five-year-old gelding. The water intake was of the order of 120 litres per day and the urinary excretion 46 litres per 12 hours. These figures were reduced to 13·3 and 6·5 respectively, within 24 hours of the administration of hypophysin, but although injections were given daily, the high level of intake and excretion returned in four days. The relapse could not be prevented by increasing the dose of hypophysin. Implants of whole horse pituitary had the same effect as hypophysin, the effect disappearing as the implant was absorbed. Combined administration of anterior lobe extracts and "antidiuretic" posterior lobe extract had no permanent result, and male sex hormone had no effect whatsoever. One kilogramme of glucose given in two litres of water produced a 40 per cent. increase in the blood-sugar level, lasting for at least three hours, but the urinary excretion was not decreased.

J. B. B.

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[**THE DEHORNING OF CATTLE.** PERERA, H. C. (1941.) *Ind. vet. J.* **17**. 349-352.]

The opinion held is that horns in domesticated cattle are unnecessary and a nuisance. The advantages of dehorning or preferably disbudding are discussed. Serious injuries to other animals, especially in the neighbourhood of the udder, are avoided. There is absence of bullying in a herd with improvement in milk yield. Injury to the horn itself is often fraught with risk of sinusitis and pain must be endured. Transportation of hornless cattle is easier, for more can be packed into a given space with greater head freedom. Horns often grow in the wrong direction and, if not corrected, cause injury to the soft tissues, notably the eye. Bulls that do not possess horns are more tractable and safer to handle.

The best age for the operation is when the calf is only a few days old, although up to the age of five months the operation is not difficult and more or less free from risk in that the horn cavity does not connect with the frontal sinus up to this age. In the young calf, after clipping the hair from the horn bud, caustic soda or caustic potash in stick form is applied for a minute or two with sufficient pressure to cause indentation. The surrounding area is protected with vaseline. Other methods in calves are the use of the knife and the actual cautery.

In adult animals dehorning shears are used, taking care that in the process about a quarter of an inch of skin is removed with the horn. The operation is performed with or without general anaesthesia.

In an editorial note it is pointed out that by blocking that branch of the lachrymal nerve which supplies the horn core the operation can be practised painlessly.

[It must be noted that under the Animals' Anaesthetics Act, 1919, dehorning of cattle over the age of one month must be carried out under a general anaesthetic.]

C. F.

[THE UTILISATION BY CALVES OF ENERGY IN RATIONS CONTAINING DIFFERENT PERCENTAGES OF PROTEIN AND IN GLUCOSE SUPPLEMENTS. Mitchell, H. H., Hamilton, T. S., and Haines, W. T. (1940.) *J. Agric. Res.* **61**. 847.]

It is commonly accepted that in a mixed ration the value of the mixture in satisfying the energy requirements of an animal may not be the weighted mean of the values of the individual foodstuffs composing the ration. This is seen in studying the relationship between the protein content of rations and the utilisation of their energy content. Hitherto most of the experiments on this aspect of nutrition have been carried out on rats or dairy cows but in the present study beef calves were used as experimental animals. The results obtained showed very clearly that the utilisation of the metabolisable energy in the rations of growing calves is not impaired by inadequate levels of protein within the limits tested. Apparently the utilisation of food energy in fattening is as efficient as in growth. Since glucose was used to dilute the protein content of the various basal rations the opportunity was afforded to determine the effect of this sugar on energy metabolism especially when incorporated in rations of diverse protein content. It was found that the addition of glucose to a basal ration depresses the digestibility of those insoluble carbohydrates (celluloses, hemicelluloses) that depend on the fermentative action of the micro-organisms of the rumen for their digestion, although the extent of these fermentations, as measured by the production of methane, is not increased. This effect is apparently a result of the substitution of glucose for insoluble carbohydrates as the substrate of the bacteria of the rumen.

J. S.

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[STUDIES ON THE LIFE HISTORY OF THE ANOPLOCEPHALINE CESTODES OF HARES AND RABBITS. Stunkard, H. W. (1941.) *J. Parasitol.* **27**. 299-325.]

The life history of the anoplocephaline cestodes, which for more than 50 years has been one of the most enigmatical of problems in parasitology, has now been partially disclosed by Stunkard. He worked out in 1937 the life-cycle of *Moniezia expansa* in sheep and found that Galumnid mites served as intermediate hosts. In 1939 he reported the life-cycle of a second species, *Bertiella studeri* of monkeys and man and of a third species, *Cittotaenia ctenoides* of European rabbits. This paper gives a more complete account of the development of the rabbit tapeworm as well as observations on two related leporine cestodes. Stunkard notes that, so far as is known, all the above-named tapeworms use oribatid mites as vectors and that it is increasingly probable that other members of the family have a similar life-cycle. During his investigations, the author dissected thousands of free-living mites, which are named, from areas where wild rabbits were numerous and cysticercoids were removed from three species. The larval worms were fed to young domestic rabbits and in one case a sexually mature specimen to *Cittotaenia ctenoides* developed. Other mites, collected from areas where they would not be exposed naturally to cestode eggs, were fed in the laboratory with tapeworm eggs. Developmental stages of the cestode were recovered from eleven species of mites and the larvae reached the cysticercoid stage in seven of these. Infections were obtained only in oribatid mites. Stunkard, like various observers (including the abstractor) has often found specimens of *Cittotaenia* in the body cavity of rabbits and hares shot in the field and examined some time later, but he emphasises that no critical evidence has so far been submitted to demonstrate a tissue invasive or peritoneal stage in the development of the cestode. Observation of abnormal and *post-mortem* conditions may easily lead to unwarranted conclusions, and in Stunkard's opinion specimens of *Cittotaenia* do not pass through the intestinal wall of live and healthy rabbits.

J. N. O.

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[INDUCTION OF SINGING IN FEMALE CANARIES BY INJECTIONS OF MALE HORMONE. Leonard, S. L. (1939.) *Proc. Soc. Exp. Med. Biol.* **41**. 229-230.]

In order to ascertain if singing in canaries is determined by testicular secretion, male hormone was injected into female birds. Five females actively engaged in nesting received 5 mg. testosterone propionate intramuscularly every three to four days. In four of the birds singing was induced, in one after two injections and in the others after four injections. The singing was continued for 5 to 13 days after the last injection. The remaining bird developed male habits, but emitted interrupted sounds which represented only part of the male song. When injections were discontinued the birds reassumed their female characteristics. It is concluded that singing is a secondary sexual character of male canaries.

D. D. O.

STRYCHNINE FOR KILLING SEALS

The Home Secretary has made an Order (S. R. & O. 1550) permitting under regulation the sale and use of strychnine for killing seals, which it is understood are causing damage to salmon fishing nets. The Order adds to Rule 15 of the Poisons Rules, 1935, the following additional proviso exempting from the application of the Rule the sale of strychnine.

(*f*) To a person producing a written authority in the form set out in the Fourteenth Schedule to these Rules issued within the preceding three months by a person duly authorised by the Secretary of State authorising the purchase of strychnine for the purpose of killing seals at the place or places specified in the authority so, however, that the quantity sold shall not exceed the quantity, being not more than four ounces, specified in the authority, and Part I of the authority shall be retained by the seller.

At the end of Rule 29a of the Poisons Rules there is inserted the following paragraph:—

(2) A person to whom strychnine is sold for the purpose of killing seals in accordance with paragraph (*f*) of the proviso to Rule 15 shall not use the strychnine for any other purpose or at any place not specified in the authority and shall take proper precautions for preventing access to the strychnine by other animals.

The form of authority for the purchase of strychnine is drawn up in a manner similar to that used for the purchase of strychnine for killing moles, except that the signature of a person authorised by the Secretary of State is needed. This form of authority becomes the fourteenth schedule to the Poisons Rules.

The Order, which is described as the Poisons (Amendment) Rules, 1941, and is dated September 22nd, 1941, comes into immediate operation.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Nov. 21st.—Meeting of the Royal Counties Division, N.V.M.A., at Reading, 2.45 p.m.

Nov. 28th.—Meeting of South Wales Division, N.V.M.A., at Carmarthen, at 2 p.m.

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Professor Dalling's New Research Appointment

The Ministry of Agriculture and Fisheries announces that Mr. Thomas Dalling, M.A., M.R.C.V.S., Professor of Animal Pathology in the University of Cambridge, has been appointed Director of the Ministry's Veterinary Laboratory, New Haw, Weybridge, in succession to Dr. W. H. Andrews, D.Sc., M.R.C.V.S., who has been transferred to the Headquarters staff of the Veterinary Inspectorate. Professor Dalling will take up his appointment as Director of the Laboratory on January 1st, 1942.

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R.C.V.S. OBITUARY

Elley, Stanley, Oudtshoorn, Cape Province, South Africa. Graduated N. Edinburgh, May 20th, 1903. Died during April, 1941.

Pilkington, John K., Capt. S.A.V.C., 326, Main Street, Jeppestown, Johannesburg, S. Africa. Graduated London, April 2nd, 1881. Died April 4th, 1941.

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CONTROL OF CATTLE DISEASES IN IRELAND

At a recent meeting of the Veterinary Medical Association of Ireland it was announced that a committee of leading veterinary surgeons, appointed by the Association, is now at work on the preliminaries of a scheme aimed at checking cattle diseases, which cost the country millions of pounds a year. It is proposed to make recommendations to the Government.

Members of the Committee include Mr. A. A. Donnelly, Drogheda; Mr. F. J. Daly, Swords; Mr. E. V. Kelly, Ceannanus Mor, Meath; Mr. J. M. Murphy, Secretary of the Veterinary Medical Association, and the President of the Association.

The meeting was attended by Mr. H. W. Steele-Bodger, immediate Past-President of the National Veterinary Medical Association of Great Britain and Ireland, who spoke on the Report and Scheme for the control of some of the major diseases of dairy cattle, formulated by the N.V.M.A.

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COST OF CONTROLLING FOOT-AND-MOUTH DISEASE EPIDEMIC IN EIRE

The Minister for Agriculture announced in the Dail on October 30th that during the foot-and-mouth disease epidemic there were 556 outbreaks, which occurred in thirteen counties and which necessitated the slaughter of 27,895 cattle, 9,797 sheep, 708 goats and 3,201 swine. The total of liabilities for compensation was £451,021. Approximately £130,000 was paid to veterinary officers and members of the L.D.F. engaged in combating the disease, and about £3,200 on disinfection and other equipment. Statistical returns as to June 1st last showed an increase of 155,700 cattle. Full compensation was paid except in cases when owners flagrantly neglected to report the existence of the disease promptly, the Minister said. Many holdings had been wholly or partially restocked, and permission to do this was withheld only from holdings on which recent outbreaks had occurred.

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SWINE FEVER CONTROL

Compulsory slaughter, with compensation, as a means of controlling outbreaks of swine fever was discussed at a recent joint meeting of the Pigs Committee and the Diseases of Animals Committee of the National Farmers' Union. It is understood that although no definite resolution was passed, the meeting was in favour of the policy of compulsory slaughter. The amount of compensation payable and a form of insurance was also discussed. It was finally agreed to set up a special committee, of which Mr. Harry German was appointed Chairman, to examine the question in detail before taking a decision.

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THE MAKING OF A PHYSICIAN

Contributing to the current correspondence in *The Times* on the subject of medical training, Sir Charles Wilson, President of the Royal College of Physicians, in the course of a letter commencing "It is not what we teach but how we teach that matters," observes: "Let the teacher have his head; no pedagogue with imagination would wish these subjects (biology, physics and chemistry) taken from the school years. Biology should be youth's reveille. It should shape the mind in the same fashion as the boy scout movement influences the character, for it is half a game. The boy who hears the life history of the eel or the story of the migration of birds without a quickening of the pulse has no place in medicine. The personality of animals is as interesting as the character of human beings and perhaps less inexplicable. Though I share Professor Blair's nostalgia for the dead tongues, I do not doubt that science can be made to fire the imagination of more boys than ever carried the Iliad through their lives. Are we prepared to acknowledge that in science the art of teaching is as yet in its infancy?

"Precisely the same doubts have troubled the conscience of those of us who are responsible for the student's instruction at his medical school. As far back as 1932 I wrote:—

> There is no way of escape from our present distresses that will or can be found until we recognise in theory and in practice admit that the making of a physician is primarily an educational and not a professional question. What do we ask of him? Is it not that he be trained not only in the observation of facts but also in the habit of handling them, in a word in methods of reasoning which alone supply any solution to the problems of professional life?

"The student is hurried out of thought by a ceaseless drill; he is so busy assimilating facts that he has little time or energy left to turn them over in his mind. Facts he must have, they are the food on which he must live; but a system which has become concerned too narrowly, too exclusively, with their mechanical acquisition is as surely a misconception. It does grave hurt to the training of the student's mind which is our first and final insurance against errors in diagnosis.

"How have we come to this pass? It is easy to teach a set of facts, more difficult to persuade the student to use his reason. It is easy to shape a question to tell us whether a lad knows this or that fact; it is not so easy to make use of the examination to test his intelligence. We have perhaps taken the line of least resistance because we have had no time to take any other. We have had little leisure to think out how we can draw from the student the best that is is him. A new technique of teaching is needed, and teachers must have time to study that technique; they must be ready to give up hours to preparation and to hard thought. I even

hope that those who are responsible for the instruction of the student in the clinical years may meet in conference every year after the fashion of the Association of Physicians to discuss the methods and aims of education.

"We are planning not for to-day but for the day after to-morrow. We are asking for the reformation of medical education. Yet there are good grounds for hope. The physicians and surgeons of this country have in the past devised a method of teaching the physical signs of disease at the bedside which has been blessed and taken as a pattern by Flexner and every other competent observer from abroad. Now the increase of knowledge and the growth of the laboratory demand something more; that something is the contribution which we in our generation have to make to medical education."

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DAIRY CULLING AND IRISH COWS

Our British policy of enforcing a measure of culling among the dairy herds has been saved from a serious dilemma by the official step in delaying the importation of cows from Ireland. At the moment the county Agricultural Executive Committees are getting to grips with the instruction from the Department of Agriculture that some culling of our dairy herds must take place. It goes without saying that when feeding is not too plentiful or individual yields are poor the average dairy farmer does not hesitate to do his own culling, peace or war. But where such a step is enforceable, it would be wholly illogical, while discarding our own cows, if we allowed Irish cows to arrive without any assurance that these cows are of a better standard, age for age, than the animals culled from our own herds. As the public are already sampling a shortening of the milk supply, which may become more acute in the next few weeks, we may yet hear a halt being called upon culling. The culled animal is supposed to be earmarked for slaughter, but it is to be hoped that the cows culled from the really good herds will be available for inclusion in the lower-producing herds so that a larger proportion of that class can be eliminated. So long as culling is confined to the unthrifty there can be no quarrel with the process.—*Farming News.*

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EFFECT OF SHEEP REDUCTION ON SOIL FERTILITY

At a recent meeting of the Livestock Committee of the National Farmers' Union the question was raised of the position of sheep farmers where War Agricultural Executive Committees were issuing ploughing-up orders and declining to take into account the fact that grass was required for sheep at certain times of the year.

It was stated that many farmers were going out of sheep production altogether, and the fear was expressed that the resulting loss of fertility would have serious repercussions on the grassland which had already been ploughed.

After considerable discussion the following resolution was passed:—

"That this Committee is seriously alarmed at the deleterious effect on the fertility of the soil, which is bound to result from the present rapid decline in the sheep population. In the opinion of the Committee, insufficient attention is given to this point when the War Agricultural Executive Committees are carrying out the Ministry of Agriculture's ploughing-up policy.

"The Committee asks that the necessary instruction should be issued to Committees to arrange their programmes so as to avoid any further reduction in sheep flocks."

A member placed before the Committee the disastrous position in which hill sheep farmers were now placed owing to the losses incurred during the previous two winters and the low prices they had received for store lambs.

SUPPLIES OF REAGENTS

To ensure regular supplies of essential laboratory chemicals a scheme has been discussed by the Society of Chemical Industry with the Raw Materials Department of the Ministry of Supply. In order to facilitate the operation of the proposed scheme, the Association of British Chemical Manufacturers has undertaken to collate records of the total quantities of the various chemicals required, so that the Ministry of Supply may be informed of these requirements. Interested persons who have not already received the appropriate form can obtain copies from the A.B.C.M.—*Pharm. J.*

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THE HORSE IN WORLD-WIDE DEMAND

In a recent article *The Leader* (Associated Periodicals, Ltd.) observes: "The horse markets in America and the Canadian West are feverishly busy. Most of the animals are of the farm type. Canadian horses, of which there are plenty, are shipped in large numbers to British Columbia, the U.S.A., Eastern Canada—even as far as New Brunswick.

"In America the demand for horses suddenly grew when Uncle Sam's army was increased and cavalry regiments augmented. Nearly 28,000 horse recruits were joined up for military service in a month.

"The same eager cry for horses is in evidence in other parts of the world. In Spain, for example, there were over 2,500 locomotives running before the Civil War. Now the number is about 800, which has set up an ever-growing call for equine labour.

"In Europe the horse-hunt goes on with unabated vigour. Petrol is not only short, but absolutely forbidden in certain places. Horse-drawn cabs have returned to the streets of Paris and other French cities, both in occupied and free territory. The clatter of hoofs has replaced the honk-honk of cars in Holland, Norway, Sweden, Finland, Belgium and the Balkans.

"In Japan, where petrol shortage verges on famine point, the prices of horses have jumped enormously, and both military and civil demands for the animal are enormous. Nippon still maintains 25 cavalry regiments.

"Note, too, our mounted troops in India and the Far East are constantly being augmented. Even before the war Britain had 21 regiments of cavalry in India.

"Needless to say, Germany has scoured the conquered countries for horses of every description. In the Polish campaign of 1939 it is estimated the Germans had over 200,000 horses in use. Even infantry regiments were accommodated with 500 animals apiece."

It is thus seen that the need for conserving petrol has led to an unprecedented demand for the horse in nearly every country in the world, and in connection with the position in Britain *The Leader* observes:—

"During the years following World War 1 something of a revolution occurred in the methods of road transportation. The internal combustion engine had come to stay. And gradually ousted from the roads were Britain's two million horses. In metropolitan areas bans on slow-moving traffic added still more to their depletion. Then came World War 2, and the rationing of petrol. The restrictions on horse-drawn traffic in the Central London area were removed and the horse again trotted through Holborn, along Oxford Street and down Whitehall, exactly one month after the declaration of war.

"As the months rolled by more and more horses were taken back into harness, until to-day, owing to increased motor taxation and further reduction of petrol supplies, their market value has in some cases gone up by as much as 100 per cent.

"Despite release of horses from at least 17 of Britain's Cavalry regiments—now mechanised—'man's best friend' is becoming so difficult to obtain that many last-war veterans are being pressed into service. In fact, one old Welsh mare pulling her weight on the land was a colt in the Boer War!

"But while it's cheaper to keep a horse in oats than a truck in petrol, it's very little easier. Reduction of feeding-stuffs is providing a major headache for at least one big railway company, each of whose 8,000 horses eats an average of 18 lb. of oats and bran daily!"

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AN INTERNATIONAL STANDARD FOR VITAMIN E

The Pharmaceutical Journal announces that an international standard for vitamin E has been established and that, as in the case of the international standards for the vitamins A, B, C and D, the National Institute for Medical Research, Hampstead, London, N.W.3, acting on behalf of the Health Organisation of the League of Nations, has undertaken to supply to laboratories, institutes and research workers throughout the world.

"Synthetic racemic α-tocopheryl acetate ($C_{31}H_{52}O_3$) has been adopted as the international standard for vitamin E. The investigation of the chemical, physical and biological properties of this substance, its suitability for adoption as the international standard, and the manner of its application in biological assay, was carried out, at the request of the Health Organisation of the League of Nations, by the Vitamin E Sub-Committee of the Accessory Food Factors Committee of the Lister Institute and the Medical Research Council. The Sub-Committee was able to enlist the co-operation of experts in 14 laboratories in Europe and America, and, as a result, it was able to recommend the adoption of synthetic racemic α-tocopheryl acetate as the international standard for vitamin E. The Sub-Committee further recommended that *the international unit for vitamin E should be defined as the specific activity of* 1 *mg. of the standard preparation, this quantity being the average amount which, when administered orally, prevents resorption-gestation in rats deprived of vitamin E.*

"In normal circumstances the results of the co-operative investigation would have been submitted for discussion at the Third International Conference on Vitamin Standardisation, which had been arranged for the autumn of 1939. On account of the war this Conference could not be held. The report and recommendations of the Sub-Committee have, however, been placed before those members and officers of the League of Nations Permanent Commission on Biological Standardisation and of the International Conference on Vitamin Standardisation, who were available and accessible, and these consented to accept the responsibility of taking such decisions as would normally be accepted by a properly constituted International Conference and by the Permanent Commission. They have accordingly adopted the proposed standard for vitamin E, accepted the recommendation defining the international unit, and authorised the National Institute for Medical Research, Hampstead, to proceed with the distribution of the standard.

"The international standard for vitamin E is issued in the form of a solution in olive oil of which one international unit is contained in 0·1 gm. It will be supplied to directors of national control centres in those countries in which these have been established, for local distribution; also to laboratories, institutes and research workers in this country, and in those countries in which national control centres have not yet been established. Application should be made to the Department of Biological Standards, the National Institute for Medical Research, Hampstead, London, N.W.3."

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INFLUENZA IN 1940-41

Teams of medical officers with ferrets and mice have carried out an investigation into the occurrence of influenza A virus from respiratory infections prevalent in England in the early months of 1940 and of 1941. Tests were made of the garglings of a number of medical practitioners, the material being inoculated into ferrets and into mice. No evidence was obtained of the presence of the virus in the early months of 1940, but in January and February, 1941, although no widespread epidemic occurred in England, laboratory studies indicated that a considerable proportion of the sporadic clinical influenza prevalent in those months was due to influenza A virus. This investigation was carried out at the National Institute for Medical Research and at a military laboratory.—(*Lancet*, 1941, **2**, 387.)

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CHERRY'S "WORLD RECORD" QUERIED

"Was Cherry's milk yield really a world record?" asks the Editor of *The Farmers' Weekly* in a recent issue, and continues: "I am tempted to ask that very pertinent question by a letter I have just seen from a well-known American dairy farmer. In this he says that five years ago a red-white Hungarian cow, Dama 171, on the estate of Prince Paul Esterhazy in Hungary, produced in 358 days, 43,351 lb. of milk, containing 1,477 lb. of butter fat. Now Cherry's figure for the 365 days was 41,644½ lb., and, unfortunately, no butter-fat records were kept. I can't vouch for the accuracy of Hungarian milk-recording methods, but I gather that this cow and her performance appear in the Register of Merit in Hungary, 1936—if anyone can come by such a volume to-day. The fact is that we really know far too little of what goes on in dairy farming outside Britain."

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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CONTROL OF ANIMAL DISEASE: THE SCHEME OF THE SURVEY COMMITTEE OF THE N.V.M.A.

To the Editor of the Veterinary Record

Sir,—Are we a National Socialist state? Or, for that matter, is Germany? It is admitted that the bloody-minded gang of perverts and fanatics that are leading Germany to her destiny scream loudly of that ideology, but what principles in laws of God or man or National Socialism govern Hitler's acts?

Where is the revolution in this country? In our Navy, Army, Air Force, our voluntary hospitals, our public schools, universities or within our own profession?

The present attempted regimentation of our country is the result of a belated conception that we have to fight for something more than life, and that we must fight, and with the general approbation of this great democracy we are going to it. *Solvitur ambulando*—but God help the hindmost!

The Survey Committee's report has no more a background of "Socialism" than has Mr. "the man in the moon," unless the N.F.U. is considered a revolutionary body.

What are these out-of-date sneers at the Victorian age? "*Laissez faire*," indeed: what about complacency, and the incredible self-satisfaction, self-righteousness and indulgence of our country in the years since 1918 that so nearly brought us to annihilation?

I consider it my duty to serve anyone who claims my professional services. The State is a good client, the farmer may or may not be: he is an individualist, addicted to complacency, to *laissez faire*, to pay or not to pay. The State gives me work, encouragement, a regular cheque, but not, as yet, security. The farmer, either through ignorance or obstinacy, often fails to realise his moral and economic responsibility to sick and ailing animals, or to his neighbour. It is my honour to serve him, but I would save him financial obligation and give him of our corporate best through the State.

Should we evolve, revolve or complacently adopt a policy of *laissez-faire* and out-Victoria the Victorians,

so that our individualism can have free range, if we are fortunate enough to be able to buy a practice?

We most certainly will have to face in post-war years reaction, slump, and overcrowded veterinary schools. We must look to veterinary education and give our students something to work for, and scheme for their reception into our ranks on a fair and honourable basis. We should aim for a State Service. The committee have done a great work in stressing what we can do for those diseases that have been considered, but we cannot give the farmers any hope of a high percentage of cures and they will expect—are expecting—greater results than we can possibly hope for. The voluntary basis will effectively prevent the worst farms being attended.

I agree with Mr. Motton, and with Mr. Anderson, but I do not agree with the latter in his statement that the Animal Health Division has been a disappointment. I consider it has been the profession's best advertisement for steady honourable and scientific service, a certain antidote to quackery, neglect, and the dangerous obsession within our ranks of the importance of small animal and sporting practice. We must concentrate on training our students for service to agriculture and our country, and practical instruction is of vital importance. I believe it to be a more pressing need than rushing through this scheme which is likely to be of more benefit to us practitioners than to our profession or agriculture.

Yours faithfully,
B. G. Catmur.

The Vineyard,
Abingdon, Berks.
November 2nd, 1941.

To the Editor of the Veterinary Record

Sir,—The interesting trend of the Crossfield-McCunn correspondence tempts me to enter the arena.

As for Mr. Crosfield's correspondence, he seems to be forgetting the ageless background of our civilisation, out of which has so slowly developed our present form of living in ordered freedom; albeit where poverty and riches still rub shoulders. The disparity of this latter condition has been and will remain a never-ending cause of human disturbance.

The titanic struggle which is going on to-day is only a further stage of readjustment, this time brought about by those classes whose lust is not only for wealth but for power, and is insatiable. Every diabolical art is employed by these leaders to use the desire of the masses for "an order which will give them a better chance of living" to promote an order which will give them no chance at all, and the stupid "mass" mind awakes so slowly as to jeopardise the result.

The colossal sacrifices which may be entailed before Hitlerism is controlled may frighten very many into a feeling of accepting his "New Order" as the best way out, but the persistent spirit of the ordinary man, and his desire for freedom and liberty, will not permit this whatever the cost. If the English-speaking peoples of the world continue true to their heritage, the violence of this attack will be contained and subdued, and at the same time a further step forward towards the millennium will have been taken. In that further advanced state a freedom of enterprise will be enjoyed and encouraged even more than heretofore, but along with it there will be a control of the disproportionate rewards which the "smart Alecs" particularly have been able to secure in the past.

The Bureaucratic Government he fears, the Nationalisation that he sees, is a temporary expedient necessary only when guns begin to bark. When this is over, sense and reason will find a way of allowing private enterprise to fit smoothly into harness with the well-being of the masses; until this time arrives, hard work for all, and a clear vision of the few, will sustain us.

If you and I can live another 20 years, the sun which heralds this brighter vista may be in full view, and Mr. Crosfield need have no fear that his individual efforts will not be allowed fully to reap their ample reward.

Yours faithfully,
Thos. A. Dobie.

27, Shrewsbury Road,
Birkenhead.
November 2nd, 1941.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th Oct., 1941	12	17	1	57	1	1	3	17	15
Corresponding period in ...									
1940	29	34	5	3,027	—	—	1	307	245
1939	18	27	4	58	—	—	9	256	182
1938	19	29	1	66	—	—	1	55	43
Total 1st January to 15th Oct., 1941	343	408	259	26,586	16	50	154	984	474
Corresponding period in									
1940	439	514	33	6,677	15	29	130	3,943	2,834
1939	602	684	73	8,013	32	72	178	2,177	1,657
1938	647	1,024	163	20,699	44	74	126	585	446

Note.—The figures for the current year are approximate only.

§Excluding outbreaks in Army Horses.